



## TABLE OF CONTENTS

Preface <i>Chris Kempes, David H. Wolpert, Peter F. Stadler, and Joshua A. Grochow</i> . . . . .	xiii
1: Overview of Information Theory, Computer Science Theory, and Stochastic Thermodynamics of Computation <i>David H. Wolpert</i> . . . . .	3
2: A Compositional Chemical Architecture for Asynchronous Computation <i>Blake S. Pollard</i> . . . . .	63
3: Information Processing in Chemical Systems <i>Jakob L. Andersen, Christoph Flamm, Daniel Merkle, and Peter F. Stadler</i> . . . . .	83
4: Native Chemical Automata and the Thermodynamic Interpretation of Their Experimental Accept/Reject Responses <i>Marta Dueñas-Díez and Juan Pérez-Mercader</i> . . . . .	105
5: Intergenerational Cellular Signal Transfer and Erasure <i>GW C. McElfresh and J. Christian J. Ray</i> . . . . .	127
6: Protocell Cycles as Thermodynamic Cycles <i>Bernat Corominas-Murtra, Harold Fellermann, and Ricard Solé</i> . . . . .	149
7: How and What Does a Biological System Compute? <i>Sonja J. Prohaska, Peter F. Stadler, and Manfred Laubichler</i> . . . . .	169
8: Toward Space- and Energy-Efficient Computations <i>Anne Condon and Chris Thachuk</i> . . . . .	191
9: Beyond Number of Bit Erasures: Computer Science Theory of the Thermodynamics of Computation <i>Joshua A. Grochow and David H. Wolpert</i> . . . . .	215
10: Automatically Reducing Energy Consumption of Software <i>Jeremy Lacomis, Jonathan Dorn, Westley Weimer, and Stephanie Forrest</i> . . . . .	263

ii: Trade-Offs between Cost and Precision and Their Possible Impact on Aging <i>Hildegard Meyer-Ortmanns</i> .....	285
12: The Power of Being Explicit: Demystifying Work, Heat, and Free Energy in the Physics of Computation <i>Thomas E. Ouldridge, Rory A. Brittain, and Pieter Rein ten Wolde.</i> ..	307
13: Transforming Metastable Memories: The Nonequilibrium Thermodynamics of Computation <i>Paul M. Riechers</i> .....	353
14: Physical Limitations of Work Extraction from Temporal Correlations <i>Elan Stopnitzky, Susanne Still, Thomas E. Ouldridge, and Lee Altenberg</i> .....	383
15: Detailed Fluctuation Theorems: A Unifying Perspective <i>Riccardo Rao and Massimiliano Esposito</i> .....	405
Index .....	457